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Processing Potential for Insect-Infected Front Range Forests

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PROCUREMENT SECTION
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Range Experiment Station
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Abstract

Increased timber harvesting by forest industry, resulting in more intensive forest management, would be a means for combating insect problems such as the current mountain pine beetle outbreak. However, existing timber processing capacity is far less than potential annual harvest of live timber for Colorado's Front Range.

245

Processing Potential for Insect-Infected Front Range Forests

**George R. Sampson, Market Analyst
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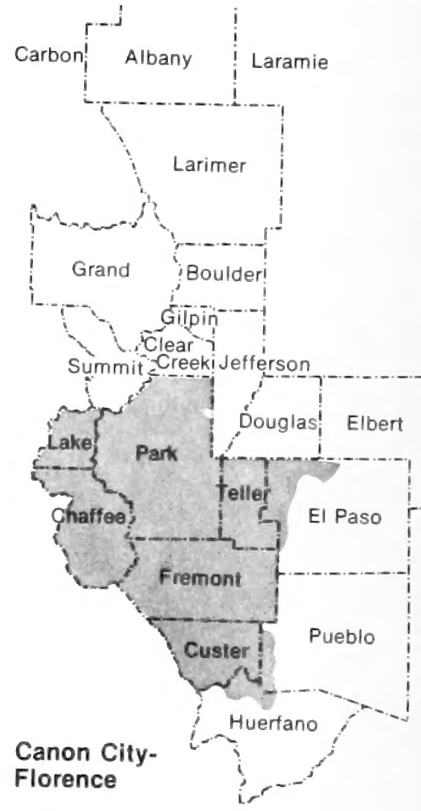
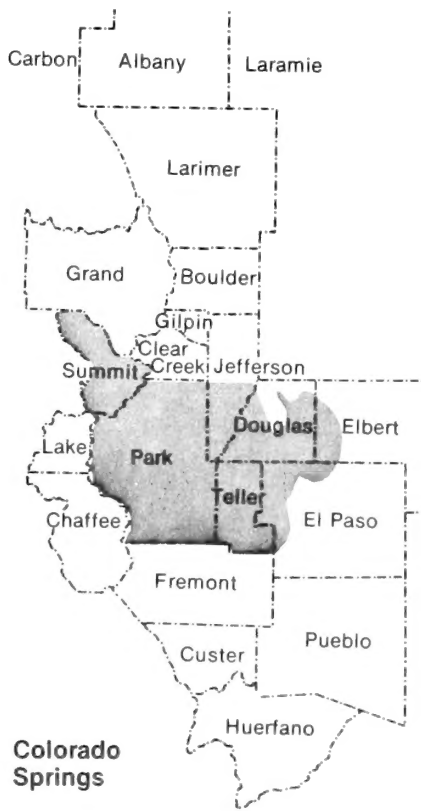
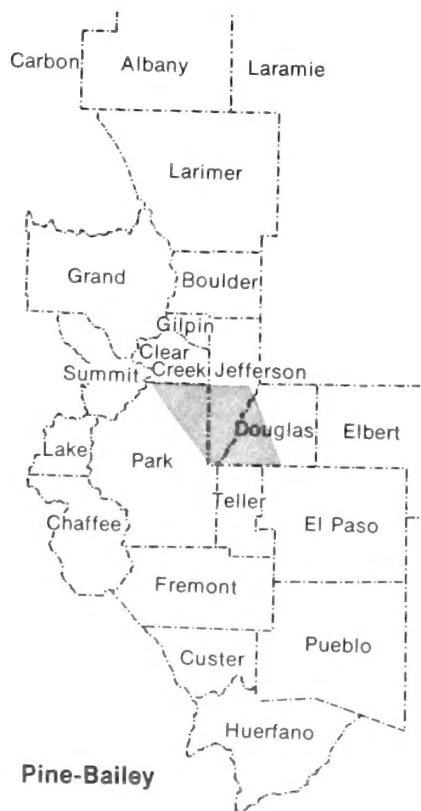
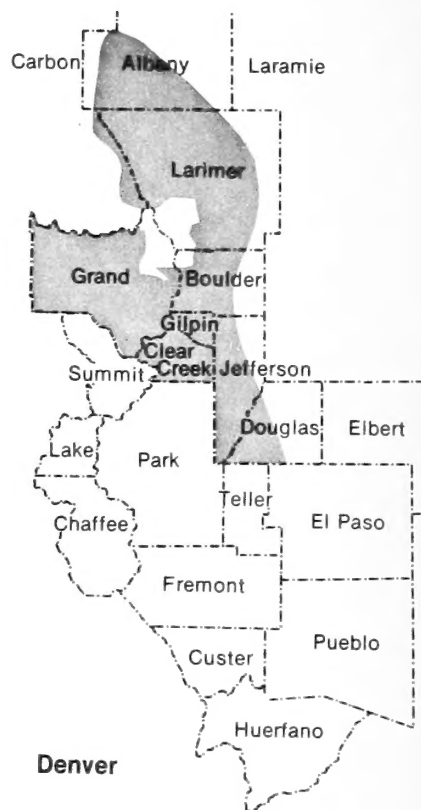
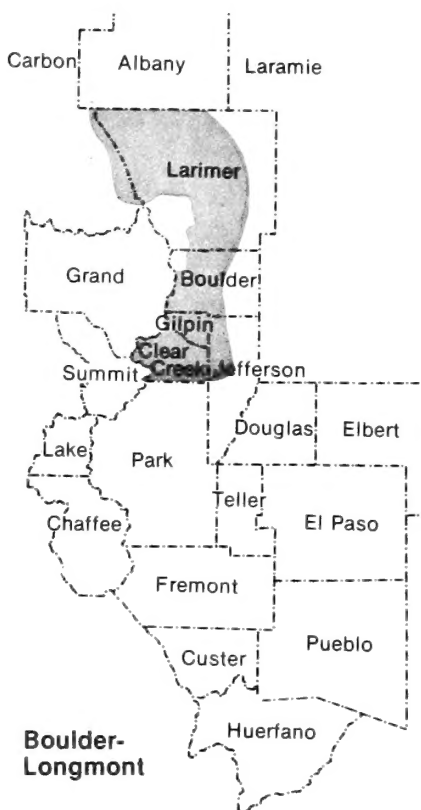
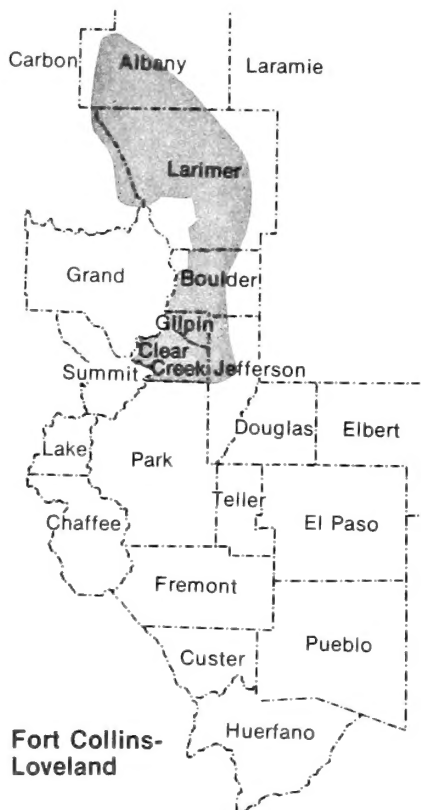
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34 miles

Figure 1.—Tributary areas for Front Range potential processing centers.

Processing Potential for Insect-Infected Front Range Forests [1, 23]

George R. Sampson, David R. Betters,
and Robert Love

Background

Much of the Front Range of the Colorado Rockies is forested, with the primary timber types being lodgepole pine, spruce-fir, and ponderosa pine (fig. 1). The mountain pine beetle (*Dendroctonus ponderosae* Hopk.) is currently in outbreak status in the ponderosa pine stands (Stevens et al. 1975). Estimates of annual timber loss vary from 5.5 to 27.3 million cubic feet.^{3,4} The increasing acreages of dead timber have rapidly increased the danger of a disastrous wildfire. Many forested areas containing the ponderosa pine type are becoming heavily populated; consequently, the increase in dead timber is detrimental to treasured aesthetics and property values. Beetle infestations spread readily between forest wildlands and residential areas, often resulting in widespread destruction of ornamental or shade trees. Most beetle infestations occur in overcrowded stands where many trees are of low vigor and, consequently, have low resistance. Any effective large-scale control program to reduce these losses must include removing infested trees along with improving the general condition of the susceptible forest. Utilizing the material to be removed for salable products can finance, or at least help finance, vegetative treatments to provide multiple use benefits while at the same time supplying needed forest products for national (and local) markets.

Purpose of Study

The purpose of this study is to make a general assessment of the total timber supply-demand situation in the Front Range area as a means of determining where and how timber utilization and timber harvesting might be increased. Increased timber harvesting would provide a means for increased forest management which would alleviate the long-term threat of mountain pine beetle and other forest insects and diseases. Since existing local forest industry uses all of the tree species present for making products, all species must be included in the demand-supply analysis.

This study is part of a three-pronged effort to determine what kinds of forest industry would be most profitable and where production units should be located to facilitate an adequate and feasible level of forest management for the Colorado Front Range. This assessment phase was done in cooperation with Colorado State University with detailed results in an unpublished report.³ One related study will determine the technical suitability of Colorado's dead Front Range ponderosa pine for various products. Another study will define market potentials for wood products from the Front Range area. Production and marketing alternatives will be specifically identified and evaluated, including the potential for new industry to utilize the volume of material that should be removed from the forest to achieve the desired level of forest management.

Procedure

Six locations were chosen as logical potential processing centers within or adjacent to the Front Range. The criteria for selections included (1) availability of raw materials, (2) existence and current capacities of the local timber industry, (3) presence of transportation networks suitable for use by forest products industries, and (4) the area's topographic features. The selected potential processing centers do not, in each case, represent a precise locality. Rather, they represent an economic center, such as that formed by the cities of Fort Collins and Loveland. Tributary timber-sheds for each of the potential processing centers were defined on the basis of current timber procurement practices of mills at that center. There is considerable overlap in these tributary areas as can be expected (fig. 1).

The potential processing center with the smallest tributary area is Pine-Bailey. This is due to the small size of firms there and the limited transportation system, which does not allow ready access to a larger area. Denver has the largest tributary area, again principally due to the transportation system, which provides good access to a large area.

In this assessment the timber resource considered was that on accessible commercial forest land where timber could be harvested in the foreseeable future using conventional logging methods. All standard and special components of the commercial forest land classification were included for national forests. The USDA Forest Service defines commercial forest land as land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. Areas qualifying as commercial forest land have

³Love, Robert, David R. Betters, Harry E. Troxell, and Warren E. Frayer. 1977. Assessment of wood raw materials in Colorado's Front Range. Unpublished report, 143 p. Colorado State University, Fort Collins.

⁴U.S. Department of Agriculture, Forest Service. [1976.] Western forest insect problem area analysis. Unpublished report, 6 p. U.S. Department of Agriculture, Forest Service, Rocky Mountain Region, Denver, Colo.

the capability of producing in excess of 20 cubic feet of industrial wood per acre per year under management. For the inventory of state and private land, Colorado State Forest Service defined commercial forest land as forest land which is producing usable crops of industrial wood and is economically available either now or prospectively. Areas qualifying as commercial forest land must have: (1) either 1,500 board feet or 600 cubic feet per acre and 40 square feet of basal area per acre of trees 5 inches d.b.h. or larger; or (2) definite seedling-sapling stands with 40% crown cover or more.

All commercial forest lands in private and other public ownerships were assumed to be accessible. Acreages and volumes of timber tributary to each of these potential processing centers were estimated. Annual mortality and volume of salvable dead timber were also estimated for each tributary area. Potential timber harvests were compared with actual harvests for each tributary area.

Results

Acreage by Timber Type

Areas of accessible commercial forest land by timber type for areas tributary to the six processing centers are shown in table 1. Despite ponderosa pine being the species of current concern for timber management purposes, it is the prevalent timber type in only the Pine-Bailey and Colorado Springs tributary areas. It occupies the second largest acreage in the Fort Collins-Loveland and Boulder-Longmont tributary areas, and the third largest in the Denver and Canon City-Florence tributary areas. For the entire area shown in figure 1, ponderosa pine type accounts for

20% (411,780 acres) of the accessible commercial forest land, while lodgepole pine accounts for 31% (650,103 acres), Douglas-fir 18% (381,348 acres), spruce-fir 22% (453,577 acres), and aspen 9% (184,361 acres). The ponderosa pine type lies at lower elevations where population is concentrated; the other types occur mainly at higher elevations.

The intermingling of different species within each timbershed generally prohibits existing as well as future forest products industries from being species specific. Timber sales usually involve several species. Thus, in analyzing forest industry alternatives that might facilitate improved forest management to alleviate the mountain pine beetle epidemic, all timber species must be included.

Live and Dead Timber Volumes

Estimates of the volumes of live and salvable dead timber tributary to each of the processing centers are shown by figure 2. The estimates are presented separately for national forests and other ownerships. The Denver timbershed has the greatest volume of timber with an estimated 1,794 million cubic feet of live timber and 330 million cubic feet of dead timber. The Pine-Bailey timbershed includes only about 278 million cubic feet of live timber and 59 million cubic feet of dead timber.

For the northern tributary areas, volumes on other ownerships are greater than volumes on national forests. However, in the southern tributary areas, volumes on national forests are somewhat greater than volumes on other ownerships. Historically, probably 90% of the annual roundwood removals for wood products other than fuel in the Front Range have come from national forests, much the same proportion as for the state as a whole (Green and Setzer 1974).

Table 1.—Commercial forest land area by species for each processing center tributary area

Processing center	Spruce-fir	Douglas-fir	Lodgepole pine	Ponderosa pine	Aspen	Total
----- acres -----						
Ft. Collins-Loveland	102,632	82,767	290,159	139,890	29,518	644,966
Boulder-Longmont	78,364	81,519	232,152	131,890	28,818	552,743
Denver	235,177	139,515	478,753	214,663	59,648	1,127,756
Pine-Bailey	40,963	70,554	31,637	90,847	16,179	250,180
Colorado Springs	144,878	191,283	88,235	240,885	55,656	720,937
Canon City-Florence	212,299	236,549	107,734	174,622	125,016	856,220
Total area ¹	453,577	381,348	650,103	411,780	184,361	2,081,169

¹Excludes overlap between areas.

Potential Annual Harvest and Present Processing Capacities

National forest timber management plans include an annual potential yield determination, which represents the maximum sustainable production the timber resource can support under management. Since comparable timber management plans are not developed for most other public and private forest lands, reliable potential yield computations are not available for these lands. A potential annual yield was estimated for these lands by assuming a potential annual yield proportional to that for nearby national forest land.

The estimates of potential annual harvest of dead timber assume that the only dead timber removed would be on areas where live timber is scheduled for harvest. Therefore, the dead timber estimate is probably conservative for both national forest land and private land because special, unscheduled salvage sales of dead timber do occur.

The annual potential harvest for the Denver timber-shed is highest with an estimated 20.7 and 3.8 million cubic feet, respectively, for live and dead timber, or a 24.5 million cubic feet total. The Pine-Bailey timber-shed has the smallest annual potential harvest with 1.3 million cubic feet of live timber and 0.3 million cubic feet of dead timber for a total of 1.6 million cubic feet.

Figure 3 compares potential annual harvest, by ownerships, with existing mill capacity for each potential processing center. The potential annual harvests

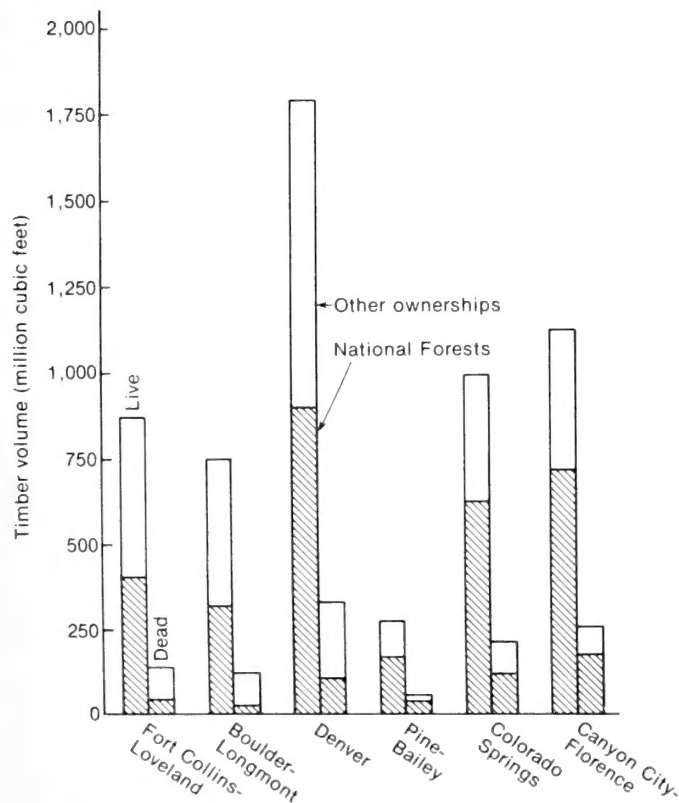


Figure 2.—Volume of live and dead timber tributary to Front Range potential processing centers.

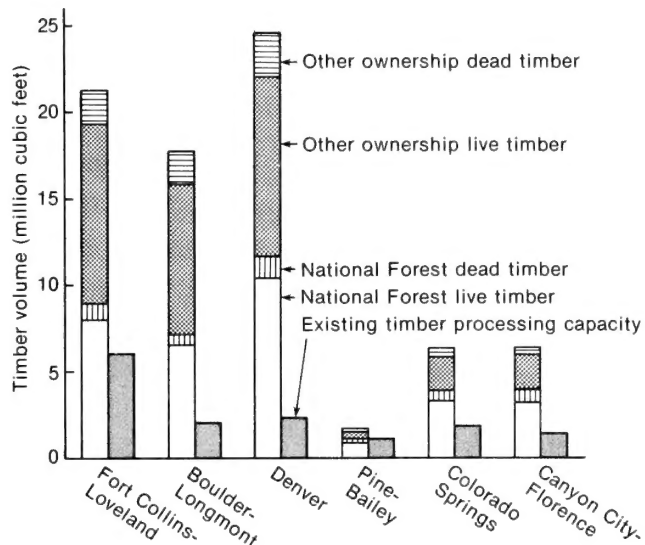


Figure 3.—Potential annual harvest by ownership and timber processing capacity by tributary area.

among timber-sheds are not mutually exclusive because of overlapping tributary areas. Potential harvest volumes are, therefore, not additive. However, the processing capacities are mutually exclusive. The total annual processing capacity along the Front Range in 1976 was estimated at 14,778,000 cubic feet, which is probably slightly conservative because of the likelihood a few small mills are not included in the data. In addition, a small amount of timber is taken out of the Front Range area and processed elsewhere.

Thinning

A widely held theory is that the best way to achieve long term mountain pine beetle control in Front Range ponderosa pine is to harvest timber at appropriate times and thin existing stands so that residual trees are maintained in a vigorous and healthy growing condition. This is partially based on the observation that Black Hills stands with a basal area conducive to good growth have, in general, few infestations of mountain pine beetle (Stevens et al. 1975). To be effective, thinning must precede epidemic attack in a stand, but the relationship between time after thinning and increased resistance to mountain pine beetle attack is not known.

One thinning system proposed for national forest land is to thin virtually all of the accessible ponderosa pine sawtimber stands and about 25% of the pole-timber stands over a 5-year period. This would affect a total of 186,700 acres of national forest land and would result in an estimated harvest of 56 million cubic feet of timber over the 5-year period. Comparable practices on private land would mean thinning more than 146,000 acres, which could yield almost 44 million cubic feet of timber in the 5-year period. The combined annual thinning volumes, given the same 5-year cutting period, amount to more than 1-1/2 times the total an-

nual capacity of Front Range mills for processing timber of all sizes and species. As a practical matter, acreage to be thinned might be substantially less, since some stands are already at or below the desired basal area. Since only limited markets such as firewood and posts presently exist for small, low quality roundwood that would be removed in programs of this scale, such large-scale thinning is probably not feasible on a commercial basis at this time. Developing better markets will, therefore, be a critical factor in any program to treat these beetle-susceptible forests on a large scale. Disposing of this material by other means, such as burning, would also be limited due to probable adverse environmental effects of smoke on the nearby communities and negative public reaction to waste. Any large-scale thinning will undoubtedly require a viable combination of public investments and product values. Developing better markets for products manufactured from this small-size, low-grade material may be a critical factor in any program to treat these beetle-susceptible forests on a large scale.

Implication of Findings

Potential annual harvest of timber for the entire Front Range far exceeds processing capacity; this is true for each of the six processing centers. That portion of the annual harvest that is dead timber is, in general, suitable for the same products as live timber. In fact, blue-stain paneling and blue-stain beams from beetle-killed ponderosa pine have become premium products over the last 2 years. Thus, from a short-run supply viewpoint, the potential for additional processing as well as additional processing capacity would seem to be good.

The Front Range ponderosa pine timber southward from the Boulder-Golden area is not yet heavily infested with mountain pine beetle and offers some potential for control by silvicultural methods. Most private owners of ponderosa pine timber are interested in controlling the mountain pine beetle on their property and would do many things including harvesting timber or thinning to accomplish this.

Unfortunately, there are a number of factors which currently inhibit expansion of the forest products industry in the Front Range to accommodate mountain pine beetle control efforts.

Since national forests contain about 65% of all commercial forest land and 50% of the commercial ponderosa pine type in the Front Range area, whatever action is taken on the national forests will have major impact on the Front Range. However, to be effective, any program to control mountain pine beetle infestations will necessarily involve a high percentage of the intermingled ponderosa pine forests in all ownerships. The same would be true of compatible utilization and marketing efforts.

In terms of staff and timber sale preparation capability, national forests are geared approximately to current industry production levels. National forests will not be able to increase their staff levels to permit greater timber products industry capacity. Also, the Roadless Area Review and Evaluation (RARE II) program has tied up, at least temporarily, hundreds of thousands of acres of national forest land tributary to the Front Range processing centers. Meanwhile, existing forest industry will not expand and new forest industry will not be attracted to the area unless there is some assurance that greater volumes of timber will be available in the future. The USDA Forest Service needs to establish confidence of potential forest products industry investors that long-term potential harvesting on national forests will be met if there is local demand. Current and future land management planning by the national forest system will place greater emphasis on coordinating timber supply goals with private and other public owners in the same timbershed.

It is difficult to achieve a long term assured supply of timber from private forest land in the Front Range. Through the Colorado State Forest Service, many designated control areas (DCA's) have been established for combating the mountain pine beetle. The land owners within a DCA are encouraged to participate in taking unified action against the beetles. However, there is no assurance that private timber owners would continue to be interested in harvesting timber in the future when there is no mountain pine beetle outbreak. In addition, much of the private forest land is in small ownerships making harvesting expensive unless a number of such ownerships can be harvested as a block. What is needed on these private forest lands is a plan for a larger economically operative area to facilitate timber harvest and other cultural treatments. This is essentially the task that Colorado State Forest Service has taken on, and more effort in this direction is needed.

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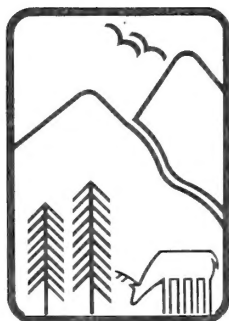
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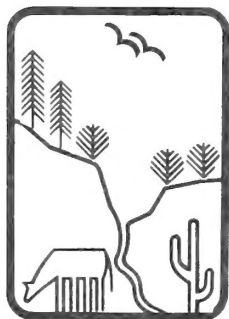
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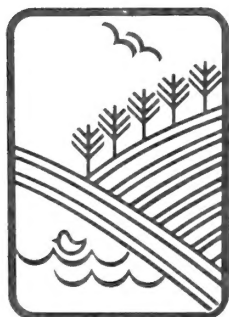




Rocky
Mountains



Southwest



Great
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Rocky Mountain Forest and Range Experiment Station

The Rocky Mountain Station is one of eight regional experiment stations, plus the Forest Products Laboratory and the Washington Office Staff, that make up the Forest Service research organization.

RESEARCH FOCUS

Research programs at the Rocky Mountain Station are coordinated with area universities and with other institutions. Many studies are conducted on a cooperative basis to accelerate solutions to problems involving range, water, wildlife and fish habitat, human and community development, timber, recreation, protection, and multiresource evaluation.

RESEARCH LOCATIONS

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Fort Collins, Colorado*
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*Station Headquarters: 240 W. Prospect St., Fort Collins, CO 80526